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Notes Upon Monilia fructigena, Pers. and Spore Germination.*

BY BYRON D. HALSTED.

During the middle of last May the writer brought a quantity of Cherry Rot fungus (*Monilia fructigena*, Pers.) from Mississippi, where he gathered it upon the excrescences of a wild plum caused by *Taphrina pruni.* At that time the cultivated cherries in New Jersey were about the size of peas, and limbs bearing the fruit were placed in tall glass dishes containing water and covered with high bell jars. The fruit of one jar was inoculated with the Mississippi *Monilia*, and after forty-eight hours there was a fine supply of the fungus covering the fruit, while the corresponding jar, with fruit untreated, ripened in due time, the cherries free from the decay.

It is with this out-of-season laboratory supply of *Monilia* that the following experiments were made. It was soon determined that the *Monilia* spores were particularly well adapted for the study of germination. In distilled water, at ordinary temperatures, they quickly send out the single germ-tube, and nearly always at one side of the oval hyaline spore. It requires from one to two hours for the production of a tube of a length exceeding that of the spore. In some cases, after five hours the tube was five to ten times the diameter of the spore. Inoculations were easily made upon green and ripe tomatoes, and various other vegetable substances, all demonstrating that this species of fungus is not confined to the stone fruits, where, however, it does its greatest damage ; but will grow upon a wide range of organic compounds. Comparative tests were, however, made in pure cherry juice and that of tomato, for example, and it was shown that the rate of development was about three times as fast upon cherry as tomato juice. Comparative tests were also made between spores in pure water and those in cherry juice. While they grew well in the distilled water, the rate was greatly augmented by the cherry juice, and in forty hours there was a fine crop of spores, borne upon stalks, rising above the cherry juice, while no spores had been produced in the glass-slip well containing only the water.

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Of more interest were the results obtained by testing the action of fungicides. The substance tested was the ammonical carbonate of copper compound, and of various strengths, beginning with the strongest; that is, three ounces of the carbonate of copper to one quart of ammonia. By this the spores were killed, as also by the half, fifth and twentieth strength. An extreme dilution was then substituted, namely, a one per cent. strength of the fungicide as used for spraying grapes, etc.; that is, one part of the ordinary vineyard strength was added to ninety-nine of pure water, which gave a liquid that contained so little of copper as to require a most delicate chemical test to detect its presence. In such a solution the spores would not germinate, but after several days, when the spores were washed five times and placed in pure water, they grew slowly. In order to carry the test a step farther, slides with pit-cells were arranged, with pure water in each, but into alternate ones a small bit of thoroughly polished copper foil was dropped, the piece being in area equal to the lead at the end of a Faber pencil. That the presence of this minute amount of metallic copper should prevent the germination of the spores was surprising, and only after many trials was the fact accepted. In only one case, in a score or more, was any spores with the copper found with tubes, and in this they had probably formed before the sowing was made. In no instance was there any failure of the spores to grow in the check-cells with pure water only. That there might be no chance of any oxide of copper or other soluble compound being present, the foil was thoroughly scoured and rubbed to a bright polish. After the bit of copper was removed and the water changed, the spores would sometimes germinate, the degree of activity depending somewhat upon the length of time they had been held in check.

If now in place of pure water in a fresh preparation a percentage of cherry juice is added to the slide-well, the spores grow, the rate depending upon the amount of stimulating fluid added. A point could doubtless be reached at which the action of the nourishing fluid would just equal that of the copper, and the spore would remain alive and inactive indefinitely.

While at first sight there does not seem to be any practical bearing for these results, upon a further consideration it may teach the truth that fungicides, as at present employed, are far stronger than they may need to be. If a bit of metallic copper in pure water will hold its own weight, or many times that, of spores inactive, it seems likely that the time has come to try a weaker solution of copper.

Since the above was written opportunity has offered to test the spores of a species of *Fusarium* and those of *Cercospora Apii*, the celery blight, both of which germinate with remarkable rapidity in water. When surrounded with their congenial food, that is, an extract of the host-plant, the rate over that of pure water is augmented many times. When copper is added to the water the spores fail to germinate, or in short, the results are the same as those reported for *Monilia.*

Similar experiments have been made with metallic zinc, but even when the spores were literally surrounded by the granulated metal they grew with vigor. A powdered form of metallic zinc was also used, and even in abundance had no retarding effect.

Some Notes on Tripterocladium leucocladulum, Muell.

As already noted in the BULLETIN, xviii. 55, this species, but once before found in fruit, has again been collected fertile.

In April, 1890, we first observed it, depending in long, wide festoons, sterile, from shelving granite ledges along the shores of Lake Pend d'Oreille, Idaho ; a month later, up a cañon, we found it again, abundantly fertile, growing very luxuriantly in large, compact masses, on ledges of dolomite as well as on the trunks and branches of *Taxus brevifolia* and *Thuya gigantea.* Last spring we met it again, fertile, on ledges of porphyritic-granite.

As is the case with most of the mosses here, it fruits at any season of the year, all depending upon the rainfall, but most abundantly during the winter when covered by four to six feet of snow.

The species varies greatly in its mode of branching, leaves, capsule, length of pedicel and size of plants. Typically, the primary stem is long, creeping, very slender, brown, of a horny consistency and sparsely beset with very small squamiform leaves. From it arises long, slender flagelliferous branches 8-15 cm. long, and shorter and more robust ones 4-6 cm. in length. The flag-